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The International Arctic Buoy Programme (IABP): A Cornerstone of the Arctic Observing Network

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***Abstract*-The Arctic has undergone dramatic changes in weather, climate and environment. It should be noted that many of these changes were first observed and studied using data from the IABP (http://iabp.apl.washington.edu). For example, IABP data were fundamental to Walsh et al. (1996) showing that atmospheric pressure has decreased (Figure 1), Rigor et al. (2000) showing that air temperatures have increased (Figure 2), and to Proshutinsky and Johnson (1997); Steele and Boyd, (1998); Kwok, (2000); and Rigor et al. (2002) showing that the clockwise circulation of sea ice and the ocean has weakened (Figure 1). All these results relied heavily on IABP data.**

In addition to supporting these studies of climate change, the IABP observations are also used to validate satellite retrievals of environmental variables, to force, validate and initialize numerical models, and to forecast weather (e.g. Figure 3) and ice conditions. Over 600 papers have been written using data from the IABP. The observations and datasets of the IABP are one of the cornerstones for environmental forecasting and research in the Arctic.

Simply maintaining the network may be the biggest challenge for the IABP given the changes in climate. The winds tends to blow the buoys away from the Eurasian coast more quickly (Figure 1), and the decline of sea ice requires the development of more robust equipment that may survive the annual freeze/thaw cycles (Figure 4).

This talk summarizes the operations, some recent research, and the challenges facing IABP up through the International Polar Year, and beyond.

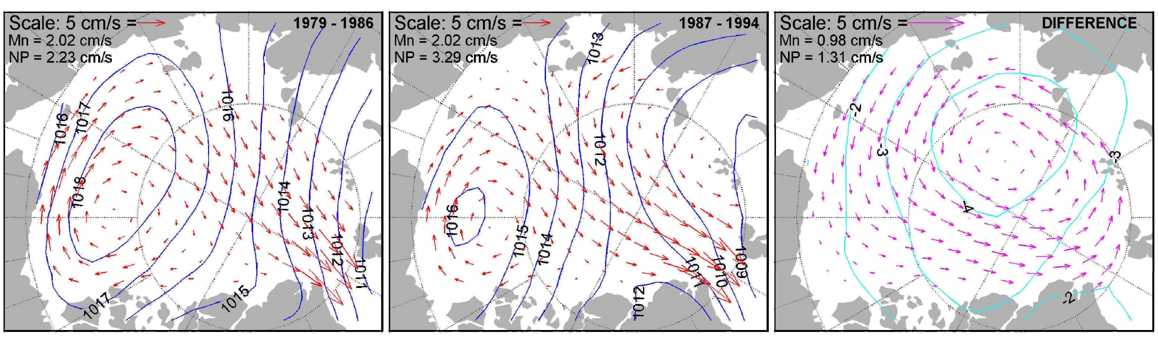

Figure 1. Mean field of SLP and ice motion for 1979–1986 (left), 1987-1994 (middle), and the difference between these two 8-year periods (right). These figures show a cyclonic anomaly in circulation (Adapted from Walsh, et al., 1996; Rigor, et al., 2002).

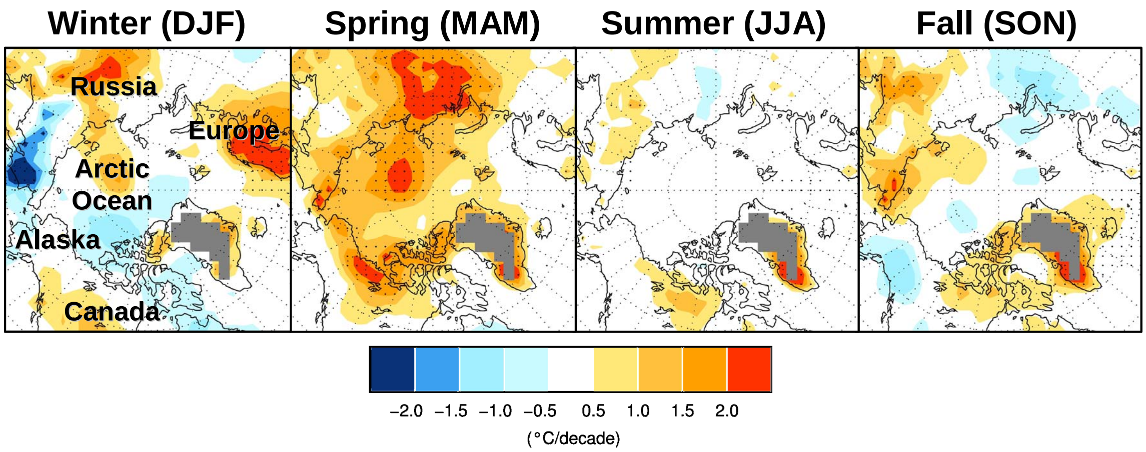

Figure 2. Seasonal Trends in surface air temperature derived from buoy data (Adapted from Rigor et al., 2000).

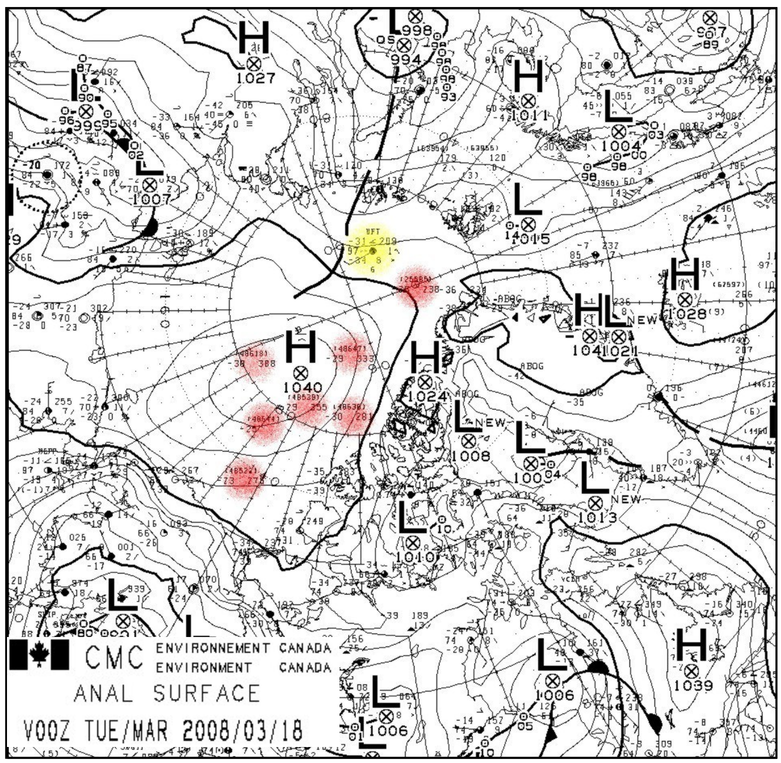

Figure 3. Analyzed field of surface air pressure for March 18, 2008.

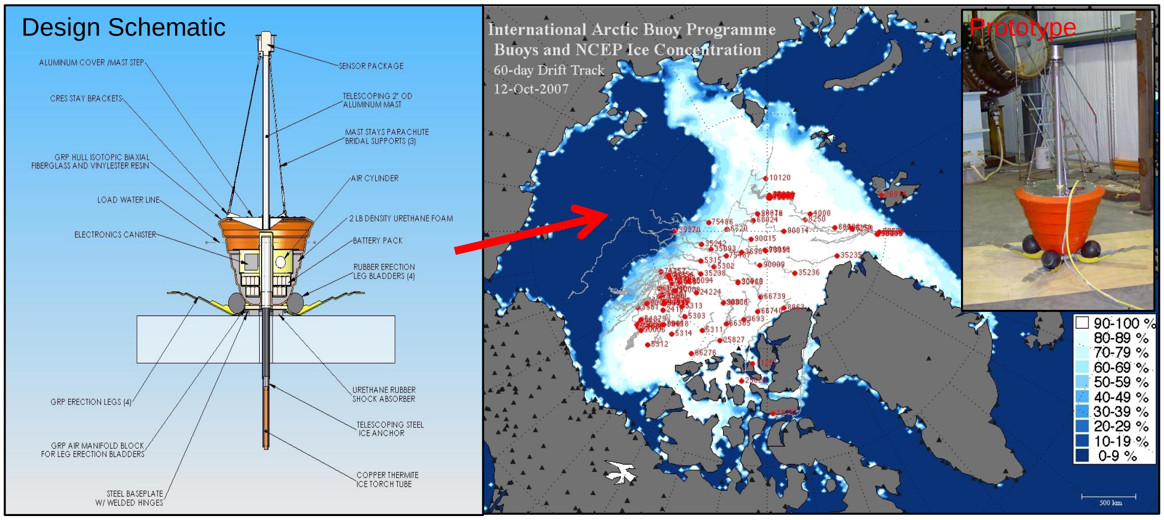

Figure 4. Schematic of a prototype Airborne eXpendable Ice Buoy (AXIB), that designed to be deployed by air, and survivethe annual freeze/thaw cycles in the larger areas of season ice in the Arctic Ocean. E.g. the map on the left shows the ice concentrations on October 12, 2007 just after the record minimum ice extent set in September 2007. Note the dearth of buoys in the areas of open, ice-free ocean (red arrow).